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USSR CONFERENCE ON AUTOMATICS

Avtomatika i Telemekhanika, No 6
Moscow, Nov-Dec 55

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A conference on the technical means (sredstvo) of automatics, sponsored by the Institute of Automatics and Telemekhanics, Academy of Sciences USSR, was held in Moscow from 31 May to 4 June 1955.

Questions relating to the development, production, and introduction of modern, technical means of automatics for the entire national economy were submitted for discussion and evinced great interest.

More than 1,100 persons participated in the conference, representing over 230 Moscow and other city organizations, including 136 scientific institutions, 10 plants, 18 ministerial technical administrations, 15 higher educational institutions, and 57 experimental-design bureaus. Representatives from industrial, scientific, and educational institutions came from over 30 USSR cities, including Leningrad, Kiev, Khar'kov, Sverdlovsk, L'vov, Baku, Vil'nyus, Dnepropetrovsk, Tbilisi, etc.

The conference was conducted in four sections: elements of automatic devices, methods and instruments of automatic control, methods and instruments of pH determination, and systems of automatic control and regulation. A total of 65 reports and papers were presented.

The exhibits of automation equipment and of technical automation literature were highly popular. Among the exhibitors were: the Institute of Automatics and Telemekhanics of the Academy of Sciences USSR, the Scientific Research Institute of Laboratory Instrument Building and Automatics (NII Laborpribor), and State Union [Experimental] Design Bureau of the Ministry of Machine and Instrument Building, the Design Bureau of Petroleum Instrument Building, the Central Scientific-Research Institute of Ferrous Metallurgy, the Special Automatics Design Bureau of the Ministry of Chemical Industry, the Energopribor Plant, etc.

Opening the conference, the director of the Institute of Automatics and Telemekhanics, V. A. Trapeznikov, cited the importance of automatizing production processes as a means of increasing productivity of labor throughout the national economy; the speaker emphasized that one of the principal requirements for extensive automation is the development of the production of high-quality technical means of automation. Although Soviet instrument building has attained some success, there exist many deficiencies. Moreover, Trapeznikov stated that the problem of the subject conference is to develop basic directions for the development of means of automation and to exchange information on newly developed elements, instruments, methods, and systems of automatic control and regulation.

In his report, "The Status and Perspectives for the Development of Apparatus for Automatic Control and Regulation," Trapeznikov gave an extended review and analysis of contemporary technical means of automation and their status in industrial production.

Trapeznikov noted the apparent tendency to convert from partial to complex automation of production processes and, even further, to automatic shops and automatic plants. In the automation of production processes three basic problems emerge, corresponding to the three stages in the development of automation: the setting up of individual regulators and the regulation of individual, mutually independent parameters of the technological process, the

STAT

combination of regulators into concurrently operating systems with the measurement of a series of parameters and the automatic alteration of assignments to individual regulators, and finally, the complex automation of the entire technological process.

The speaker also noted the tendency to change from conducting processes by individual parameters to conducting them by product quality, as well as the change toward automatically conducting a complex process by combined parameters, which are the function of a series of measurable and regulatable parameters. For the subsequent development of production-process automation, moreover, computers and simulation devices, which permit the computation of these combined parameters, are of considerable importance.

Touching upon the production of technical means of automation, Trapeznikov stated that production is insufficient and indicated that up to now Soviet industry produced apparatus and instruments for the control and regulation of independent parameters only; moreover, this equipment was produced in insufficient quantity and, in many cases, was outdated.

In studying the trends in the development of automatic regulation devices, Trapeznikov suggested some basic principles which should be considered. The problem of the regulation of individual parameters, for instance, can be most easily solved by a universal apparatus with a broad assortment of electrical, pneumatic, and hydraulic regulators and a complete set of transducers, transistional devices, and executing organs. Complex systems are best designed along the block (aggregate) principle. Problems of complex automation, based on centralized control, require the use of telecontrol and telemasuring devices.

In conclusion, Trapeznikov stated certain concrete proposals basic to the subsequent development of instrument building and the introduction of automation into industry. These proposals were reflected in the resolutions of the conference.

G. G. Iordan, NII Laborpribor, read a report on "The Status, Development, and Use of Radioactive Methods of Control of Measuring" at a plenary session. The report stated that the creation of new technical means of automatics using nuclear radiations are based on the tremendous penetrating ability of these radiations and on the presence of a wide energy spectrum permitting the use of the phenomena of absorption of radiation by matter.

Candidate of Technical Sciences E. Ya. Kogan of the Institute of Automatics and Telemechanics, Academy of Sciences USSR, presented a report on simulation. He described the design principles of the simulator developed in the Institute of Automatics and Telemechanics and demonstrated it in operation.

The remainder of the conference was conducted in the sections.

The "Elements of Automatic Devices" section heard and discussed 20 reports and 3 notices which dealt with the current status of the theory and production of the elements of automatics, relay devices, elements with non-linear characteristics, (and the contact, magnetic and dielectric materials required in their production), and control apparatus.

The following presented reports on relay apparatus: Doctor of Technical Sciences B. S. Sotskov (Institute of Automatics and Telemechanics), "Basic Tendencies in the Development of Relay Control"; Candidate of Technical Sciences M. I. Vitenberg (Scientific-Research Institute, Ministry of Radio Engineering Industry), "Electromechanisms (Relay) as Elements of Automatics and Telemechanics"; Engr V. Z. Royzen (Krasnaya Zarya Plant), "Modern Types of Polarized Relays"; Candidate of Technical Sciences A. V. Gordon (a plant

STAT

of the Ministry of Aviation Industry), "Relay Apparatus in Aircraft Equipment"; Candidate of Technical Sciences B. F. Malinskiy (Central Scientific-Research Institute, Ministry of Railways), "Relay Apparatus Used in Railroad Automatics and Telemechanics"; Doctor of Technical Sciences G. I. Atabekov (Moscow Aviation Institute), "Magnetolectric and Polarization Type Relay Shields"; and Candidate of Technical Sciences F. A. Stupel' (Khar'kov Polytechnic Institute), "Questions in the Development of High Speed, Direct Current Electromagnetic Mechanisms."

Reports on new types of elements with nonlinear characteristics and on new materials elicited great interest. These reports were made by Doctor of Technical Sciences B. T. Kolomiets (Scientific-Research Institute, Ministry of Radio Engineering Industry), "Contemporary Industrial Types of Thermistors and Photo Conductors and Their Utilization in Industrial Automatics"; Candidate of Technical Sciences I. T. Sheftel' (Scientific-Research Institute, Ministry of Radio Engineering Industry), "New Industrial Types of Thermistors"; Candidate of Technical Sciences T. N. Verbitskaya (Scientific-Research Institute, Ministry of Radio Engineering Industry), "Segneto-Ceramic Nonlinear Elements -- Variconds"; Engr Yu. S. Volkov (Scientific-Research Institute of High Frequency Currents), "Use of Nonlinear Dielectrics in High-Frequency Current Technology"; Engr Yu. A. Kamenetskiy (Scientific-Research Institute, Ministry of Radio Engineering Industry), "Soviet Crystal Triodes", Doctor of Technical Sciences V. V. Usov (Scientific-Research Institute, Ministry of Electrical Engineering Industry), "Materials for Electric Apparatus Contacts"; Candidate of Technical Sciences Z. S. Kirillova (Scientific-Research Institute, Ministry of Aviation Industry), "Contemporary Contact Materials"; Doctor of Technical Sciences N. V. Aleksandrov (All-Union Electrical Engineering Institute), "Insulating Materials Used in Instrument Building"; Candidate of Technical Sciences D. I. Gabrielyan (Central Scientific-Research Institute of Ferrous Metallurgy), "Contemporary Magnetic Materials"; Doctor of Technical Sciences M. A. Rozenblat (Institute of Sound Recording), "Magnetic Amplifiers"; and Candidate of Technical Sciences I. N. Stepanenko (Moscow Power Engineering Institute), "Use of Crystal Triodes."

Reports dealing with control apparatus were presented by: Candidate of Technical Sciences P. F. Klubnikin (Scientific-Research Institute, Ministry of Aviation Industry), "Electromagnetic Couplings"; Engr E. I. Minsker (Experimental Scientific-Research Institute of Metal Cutting Machines), "Means of Automation in Machine Tool Building"; Engr O. N. Tatur (Experimental Scientific-Research Institute of Metal Cutting Machines), "Electromagnetic Couplings in Machine Tool Building"; Engr A. S. Reznikov (State Scientific-Research Motor Vehicle and Automotive Institute), "Magneto-Emulsion Couplings"; and Engr G. M. Fridlizer (State Planning Institute of Mechanization), "Transient Processes in Electromagnetic Couplings."

The "Methods and Instruments of Automatic Control" section heard 13 reports. Papers on the measurement and control of consumption, temperature, and gas analysis were presented by: Candidate of Technical Sciences B. K. Kremlevskiy (All-Union Scientific-Research Institute of Hydrolysis and Sulfite-Alcohol Industry), "Instruments for Measuring Consumption in Systems of Automatic Control and Regulation"; Engr D. L. Orshanskiy (State Union [Experimental] Design Bureau), "Contemporary Methods of Measuring Temperature"; Candidate of Technical Sciences M. A. L'vov (Moscow Institute of Communications), "Measuring Thermal Parameters in a Gas Jet"; Doctor of Technical Sciences D. Ya. Svet (Institute of Mechanics, Academy of Sciences USSR), "Problem of Radiation Pyrometry and the Radioelectron System of Measuring High Temperatures"; Engr V. A. Pavlenko (State Union Experimental Design Bureau of Gas Analysis), "Contemporary Methods of Gas Analysis"; Candidate of Technical Sciences B. S. Sinitsin (Leningrad Polytechnic Institute), "Analysis of Static Error in Systems of Automatic Control."

STAT

A report was also presented by Candidate of Technical Sciences I. K. Vinogradov (Leningrad Branch - Heavy Industry Electric Planning [LO - Tyazhpromelek-troproyekt]) on transducers (datchik) of strip stress in a cold-rolling mill and the breaking and slippage of a conveyor belt.

The following presented reports on the practical utilization of control and measuring methods by using radioactive isotopes: Engr G. G. Iordan, "Radioactive Methods of Measuring the Level of Liquids or the Boundaries Between Media of Various Densities"; Engr L. K. Tatochenko (Central Scientific-Research Institute of Ferrous Metallurgy), "Use of Gas Meters in Devices for the Measurement and Control of the Level of Liquid Metal"; Engr B. I. Verkhovskiy (Physics Institute, Academy of Sciences USSR), "Use of Radioactive Isotopes for Measuring Thickness"; Engr V. A. Yanushkovskiy (Institute of Physics, Academy of Sciences Latvian SSR), "Radioactive Method of Marking Rolled Steel With Automatic Steel Mark Control"; Candidate of Physicomathematical Sciences V. B. Brodskiy (NII Laborpribor), "Radioactive Methods of Measuring Pressure"; Engr A. I. Slatinskiy (Central Scientific-Research Cotton Institute), "Use of Radioactive Isotopes in the Textile Industry."

The section on "Instruments and Methods of pH Determination" heard the following reports: Candidate of Technical Sciences L. I. Belen'kiy (Central Scientific-Research Cotton Institute), "Current Status of the Application of Control and Regulation of pH in Technological Processes"; Corresponding Member of the Academy of Sciences USSR B. P. Nikol'skiy (Leningrad State University), "Activities of the Chair of Physical Chemistry of the Leningrad Branch of the Leningrad State University (LOLGU) in the Theory of the Glass Electrode and Its Practical Application"; Candidate of Chemical Sciences M. M. Shul'ts (Leningrad State University), "The Sodium Function of a Glass Electrode"; Doctor of Chemical Sciences P. A. Izmaylov (Khar'kov State University), "Behavior of a Glass Electrode in Acid Media"; Engr A. M. Aleksandrova (Khar'kov State University), "Behaviour of a Glass Electrode in Nonaqueous Media"; Candidate of Chemical Sciences V. V. Aleksandrov (Khar'kov State University), "Standardization of the pH Scale in Aqueous and Nonaqueous Media"; Candidate of Chemical Sciences A. A. Shcherbakov (Ural Scientific-Research Chemical Institute), "The Work of the Ural Scientific-Research Chemical Institute in the Automatization of the Industrial Control of pH"; Engr A. S. Benevol'skiy (Central Laboratory of Automatic Devices, Ministry of Ferrous Metallurgy), "Use of the Glass Electrode in the Control of pH."

The "Systems of Automatic Control and Regulation" section heard the following reports: Corresponding Member of the Academy of Sciences USSR V. A. Trapeznikov, "Unified Apparatus for the Control and Regulation of Complex Automation Systems"; Candidate of Technical Sciences V. D. Mironov, "Apparatus of Electronic Automatics"; Candidate of Technical Sciences Ye. K. Krug (Institute of Automatics and Telemechanics), "Electrical Executing Device With Regulatable Speed"; Doctor of Technical Sciences V. A. Timofeyev, "Objective Means of Evaluating the Properties of Automatic Regulation Systems Under Realistic Operating Conditions."

The following reports were presented on pneumatic-hydraulic automatics and regulators: Doctor of Technical Sciences M. A. Ayzerman (Institute of Automatics and Telemechanics), "Basic Tendencies in the Development of Industrial Pneumatic-Hydraulic Automatics"; Engr P. M. Shanturin (Central Laboratory of Automatic Devices, Ministry of Ferrous Metallurgy), "Pneumatic Control and Regulation Apparatus"; Candidate of Technical Sciences P. Ye. Boloben (All-Union Thermal Engineering Institute), "Hydraulic Automatics Apparatus."

STAT

The reports evoked lively discussions. Participants commented on the timeliness and value of the conference on technical means of automatics and noted deficiencies in the operation of scientific-research and experimental-design organizations in their development and mastery of new technical means of automatic control and regulation.

The supervisory activities of the Ministry of Machine and Instrument Building were severely criticized in relation to the production of automatics apparatus and instruments. It was noted that the industrial output and variety of technical means of automatics produced by enterprises under this ministry lagged considerably behind the needs of the national economy.

In an adopted resolution it was emphasized that the automation of productive processes is currently one of the basics of technical progress. The development of automation is, to a considerable extent, determined by the status of the production of technical means of automatics. During recent years certain successes in the production of the technical means of automatics and telematics were achieved, in experimental work based on new methods of automatic control, including photoelectric, ionization and infrared rays, and in the mastery and output of many types of relay apparatus and new elements with nonlinear characteristics (crystal triodes, variconds, photoconductors, thermistors, etc.)

Nonetheless, the development and production of a sufficient variety and a sufficient number of instruments and means of automatics still considerably lags behind actual requirements.

The development of production automation requires the simultaneous solution of four problems: (1) development and organization of production of an extensive variety of instruments and means of automation, i.e., the creation of a material base for automation; (2) the development of typical automation schematics to meet the more common industrial needs; (3) the creation of technological equipment and processes providing for complex automation and the possibility of using present methods of automatic control; (4) automatizing some important production processes, and studying the experience and the technical-economic effect of automation.

Just as the production of the means of production had a decisive importance, so does the development and production of the means of automation, in sufficient quantity and variety, have a similar importance. The means of automation must be so correlated and coordinated that the creation of the most diverse automation systems would be possible with the use of a relatively small number of standardized instruments and assemblies.

Moreover, the instruments being produced are limited and are not designed for complex automation. Many instruments lag behind contemporary technical levels.

Insufficient attention is devoted to the production of certain highly necessary component instruments (electronic regulators of an over-all industrial nature, electropneumatic and electrohydraulic converters, etc.), while other important instruments are produced in very limited varieties (many transducers [datchik], executing organs, etc.). Moreover, some types of instruments are designed and made by several organizations simultaneously, with not the best design always approved for production since there is no organization to make a comparative study of the designed specimens.

The production of instruments, including those of an over-all industrial nature, is distributed among instrument-building plants of various ministries.

STAT

The conference adopted a resolution recommending that the instrument-building organizations develop such means of automatics as would assure complex automation of production processes, for which uniform instrument standards must be established so that instruments would fit into any automation scheme. The more comprehensive methods for the creation of means of automation are: development of systems along the aggregate (block) principle (which should not exclude the production of base design instruments or direct-action regulating apparatus), control of processes by quality of output, conversion to contactless elements, wide use of compensating methods, and the application of modern physics and electronics and of computer devices.

The conference resolution especially emphasized the point that in the rapid development of production automation, the principal factors are complete range of components, diversity of production, and the need of being able to get all necessary component parts, in a set, from one source.

It is recommended that the production of all technical means of automatics of a general industrial nature be concentrated in one ministry (for instance, the Ministry of Machine and Instrument Building). Moreover, it is necessary that the instrument-building facilities of other ministries be expanded for the production of special instruments meeting the specifications of the given ministry. It is also necessary that the branch automatics laboratories and experimental design bureaus be strengthened and supplied with necessary equipment.

The lack of coordination between the scientific-research organizations and design bureaus was noted and it was recommended that coordinating responsibility be vested in the State Engineering Commission and the Academy of Sciences USSR.

The conference noted the unsatisfactory status of dissemination of information on USSR and foreign activities in the technical means of automatics, and the insufficient periodicals and special technical literature. It recommended regular publication of reference materials and catalogs on apparatus produced in USSR plants and used for automatizing production, publication of data on foreign developments, and publication of periodicals intended for an extensive audience of instrument builders, planners, and users.

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